Destination L1: A Thematic Unit

The Inclined Pendulum

STUDENT ACTIVITY

BACKGROUND INFORMATION

In this activity you will learn about Kepler's Third Law of Planetary Motion. This activity demonstrates the relationship between velocity and increased gravitational pull.

The Inclined Pendulum

Ring
Marble
Plywood

McREL

PROCEDURE

1. Obtain the materials for this activity.

2. Place one book under the apparatus. Place a marble inside the ring and practice letting it roll back and forth in an arc.

3. Practice counting the number of times the marble swings across in 10 seconds.

4. Once you have practiced, place the marble in a marked spot and count the number of swings in 10 seconds. Repeat this two more times. Make sure to release the marble from the same place. Record this information in your data table.

5. Add one more book to the bottom of the apparatus. Repeat procedure 4. Adding books simulates increased gravity.

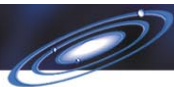6. Repeat procedure 4 using three, four and five books.

DATA TABLE

Number of Books	Trial 1	Trial 2	Trial 3	Average
1				
2				
3				
4				
5				

7. On a sheet of graph paper, make a graph that shows the average number of swings per 10 seconds versus the number of books used.

8. Based on your results, how does the amount of gravity affect the velocity of the marble?
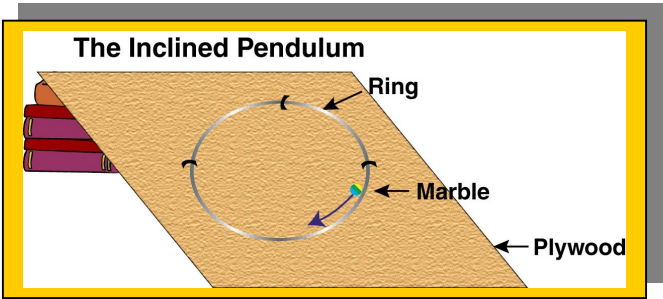
9. In what ways does this compare with planets orbiting the sun?

For the next procedure, refer to the table below:

Mean Orbital Velocity and Mean Distance to the Sun									
Planet	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune	Pluto
Mean Orbit Velocity (km/s)	47.87	35.02	29.79	24.13	13.07	9.67	6.84	5.48	4.75
Mean Distance to the sun (AU) R	0.39	0.72	1.00	1.52	5.20	9.54	19.19	30.07	39.48

10. Based on the mean orbital velocity and the mean distance from the sun (shown above), describe the relationship between the distance from the sun and the orbital velocity.

11. Through these activities, you have learned about the concepts involved with Kepler's Third Law of Planetary Motion. Based on what you have completed in these activities, describe Kepler's Third Law in your own words.

12. Using the Internet, reference material, or the Genesis Glossary, look up Kepler's Third law of Planetary Motion.

13. High School Extension: using the expression $T^2=R^3$ (where T is equal to the orbital period and R is equal to the semi-major axis), calculate the orbital period for each planet.

Planet	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune	Pluto
Orbital Period T									